Comparisons of AIRS profiles against dedicated sondes
(work in progress)
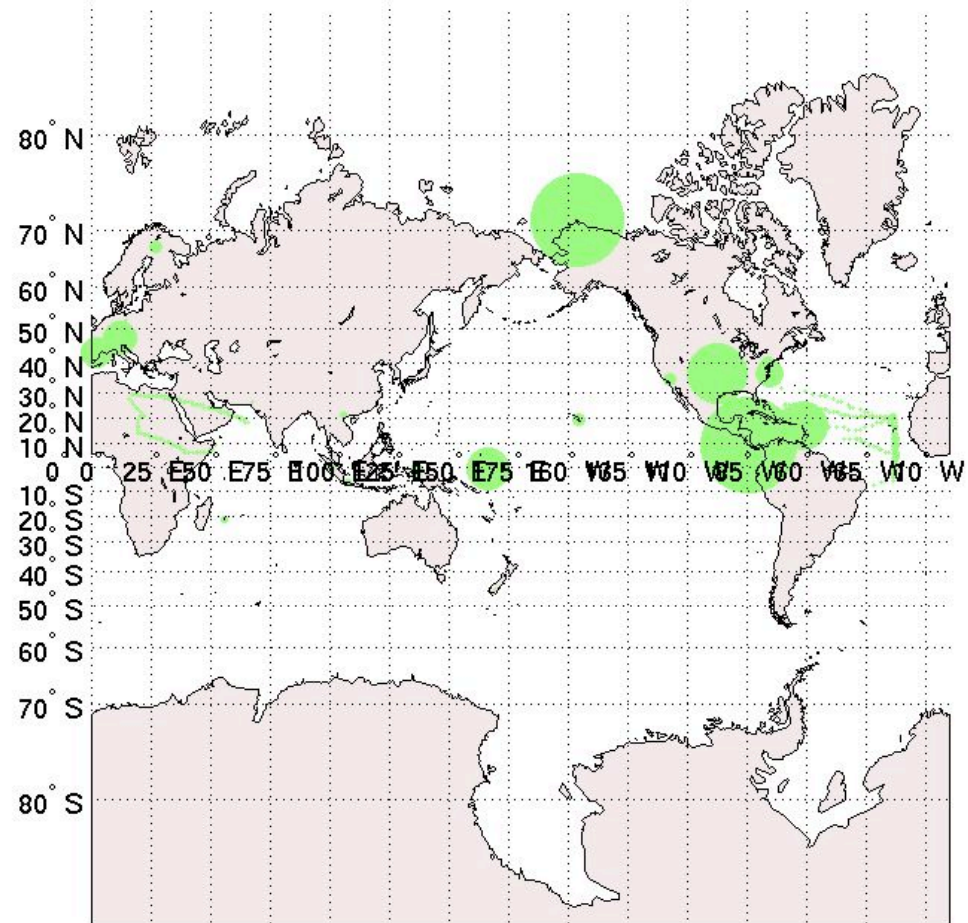
Bill Irion, Eric Fetzer,
Van Dang, Evan Manning
Jet Propulsion Laboratory
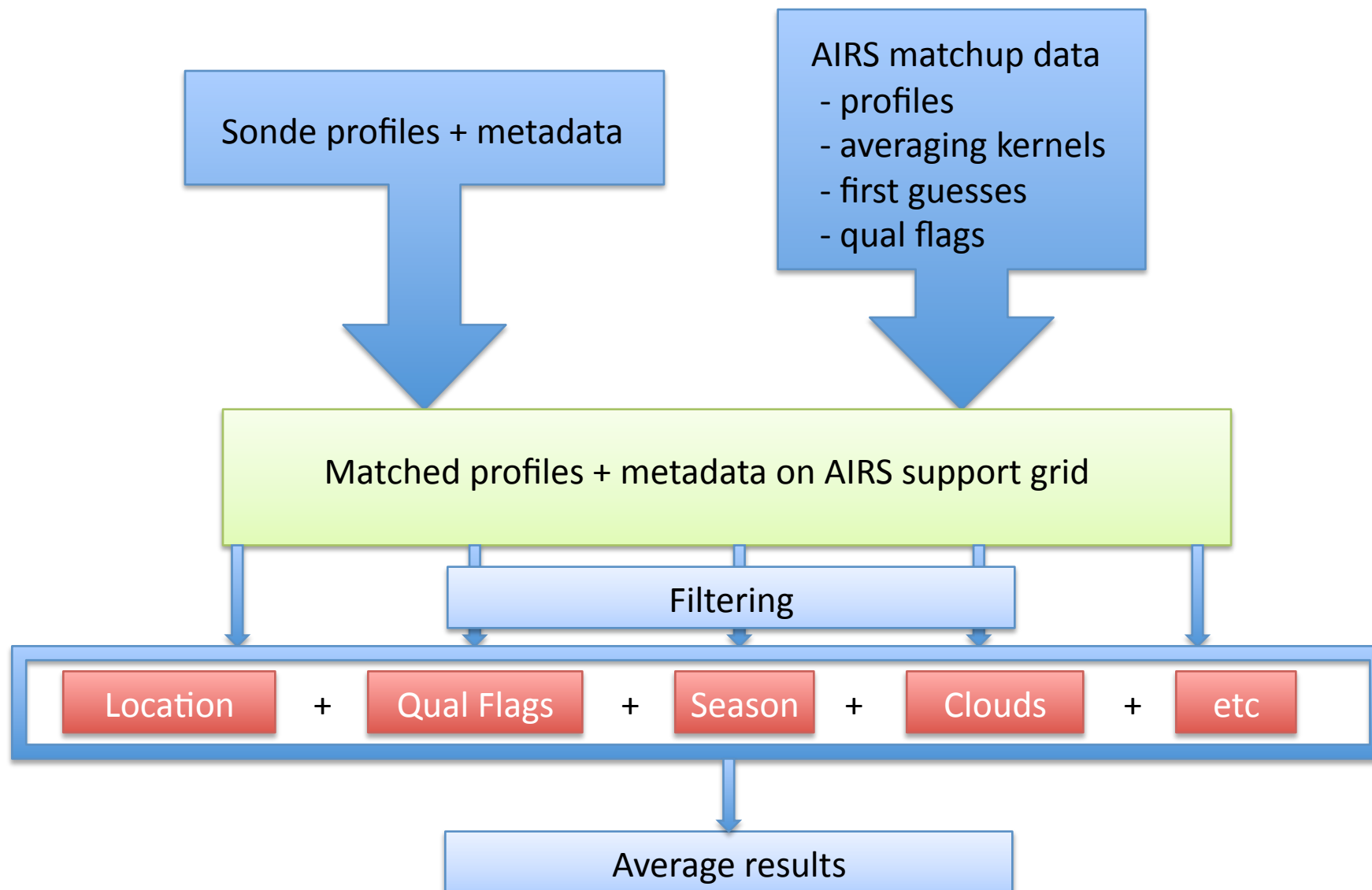### California Institute of Technology

With many thanks to all who provided
sonde data to us

Sonde data characteristics

- ~880 sondes
- ~7400 AIRS matchups within 3 hrs and 100 km

Modus operandi

Sonde profiles + metadata

AIRS matchup data
- profiles
- averaging kernels
- first guesses
- qual flags

Matched profiles + metadata on AIRS support grid

Filtering

Location + Qual Flags + Season + Clouds + etc

Average results

AIRS –Sonde comparisons made

- L2 result compared to sonde profile interpolated to AIRS support grid
  - By level if temperature
  - By slab column if gas
- Init profile to sonde
  - How good (or bad) was our first guess
- L2 to "Kerned" sonde profile: $\hat{x}$
  - Sonde profile multiplied by averaging kernel:

$$\hat{x} = x_{init} + A(x_{sonde} - x_{init})$$

  - This is what AIRS "should have seen," given its sensitivity and vertical resolution

Sample results

of matchups

"Unkerned"

"Kerned"

Initial

All qual_temp flags ≤ 1
2 hr, 100 km matchup range

Only one AIRS observation per
sonde added to average

RMS

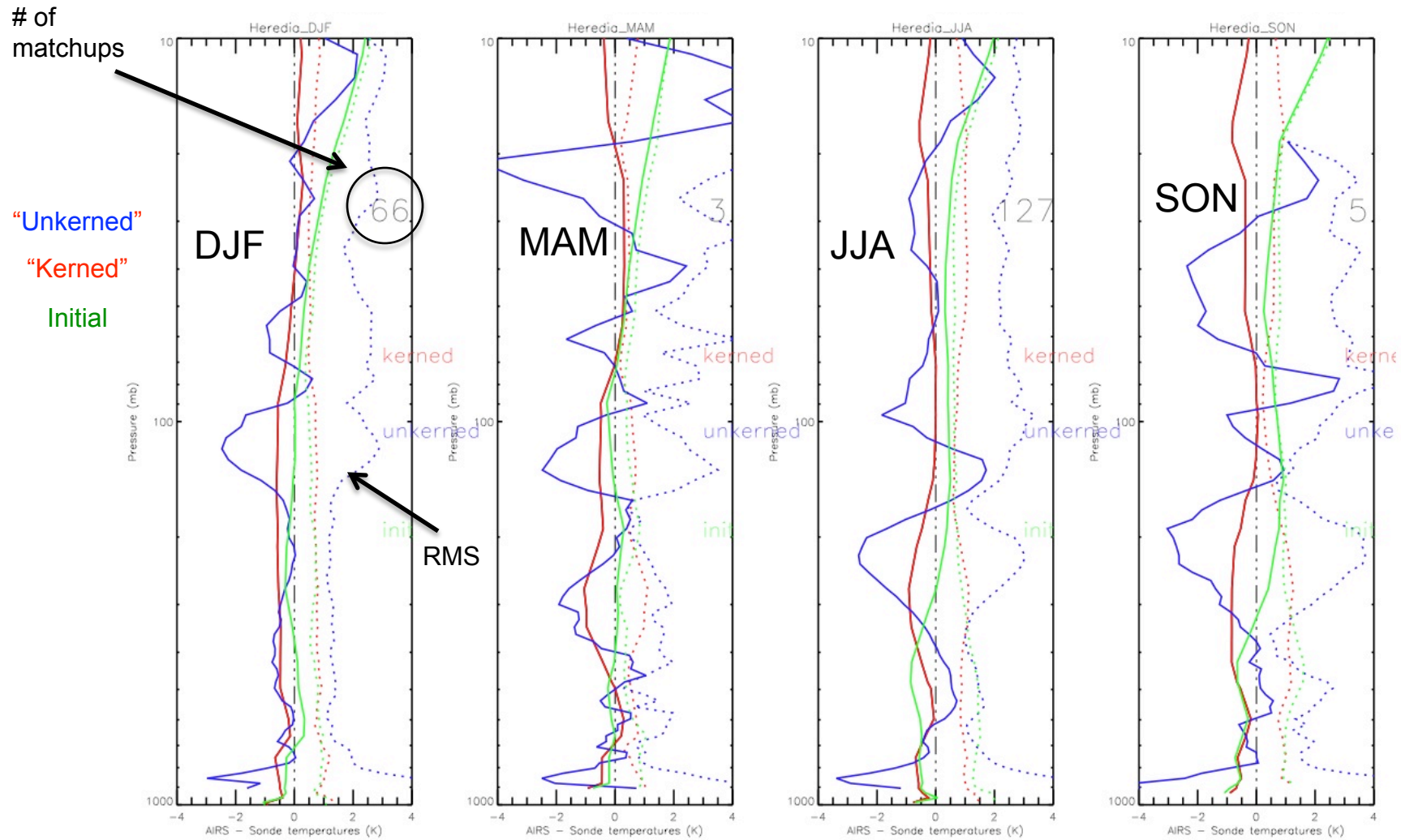Beltsville

Biak

Chesapeake

Hanoi

Heredia

Rico

SGP

Sodonkyl
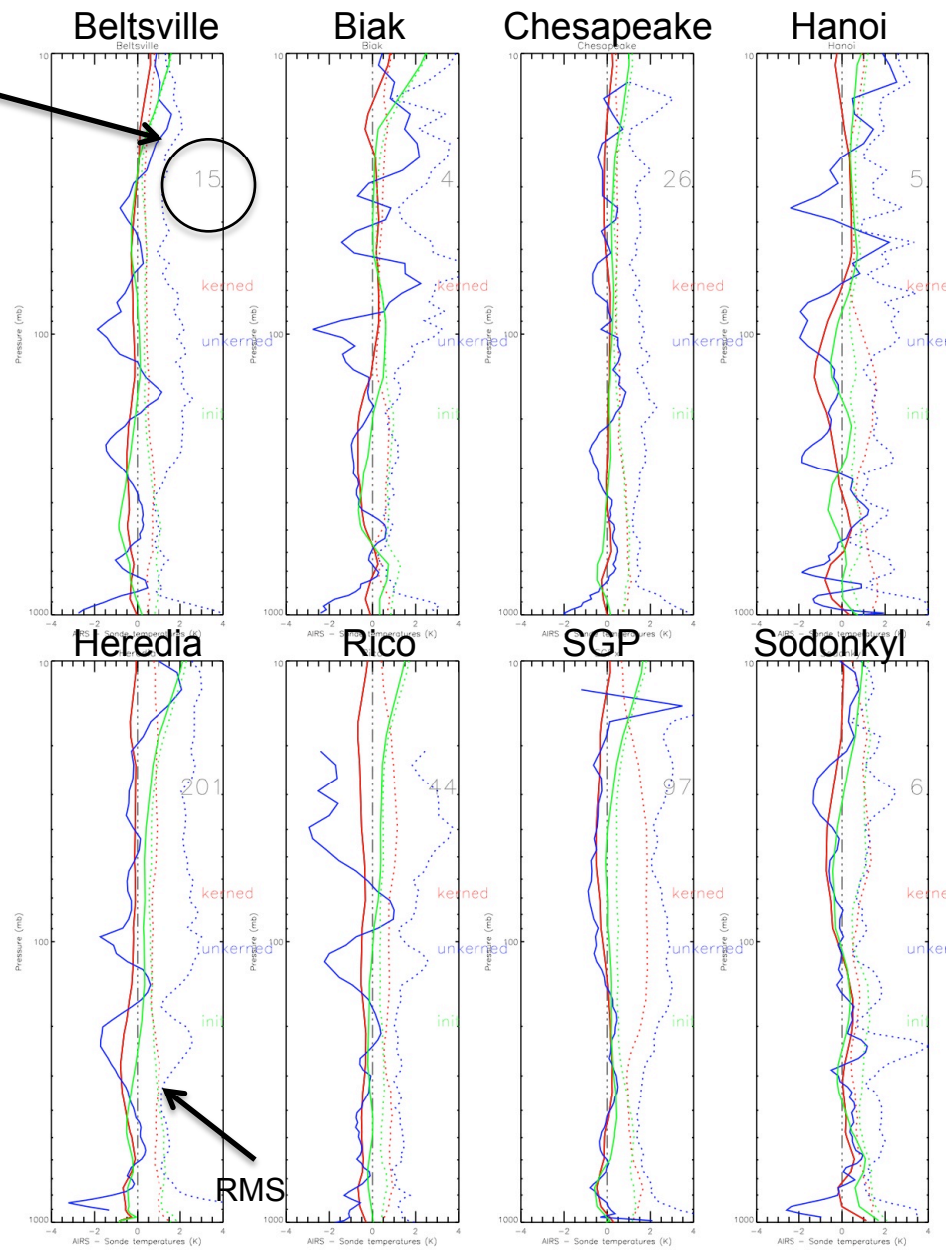
Heredia, Costa Rica
Temperature profile comparison by season

Only one AIRS observation per sonde added to average
All temperature qual flags <= 1, within 100 km, 2 hrs

# of matchups

"Unkerned"
"Kerned"
Initial

RMS

DJF MAM JJA SON

Comparison for Chesapeake SON season by cloud fraction

One-to-one matchup, all temperature qual flags <= 1, within 100 km, 2 hrs
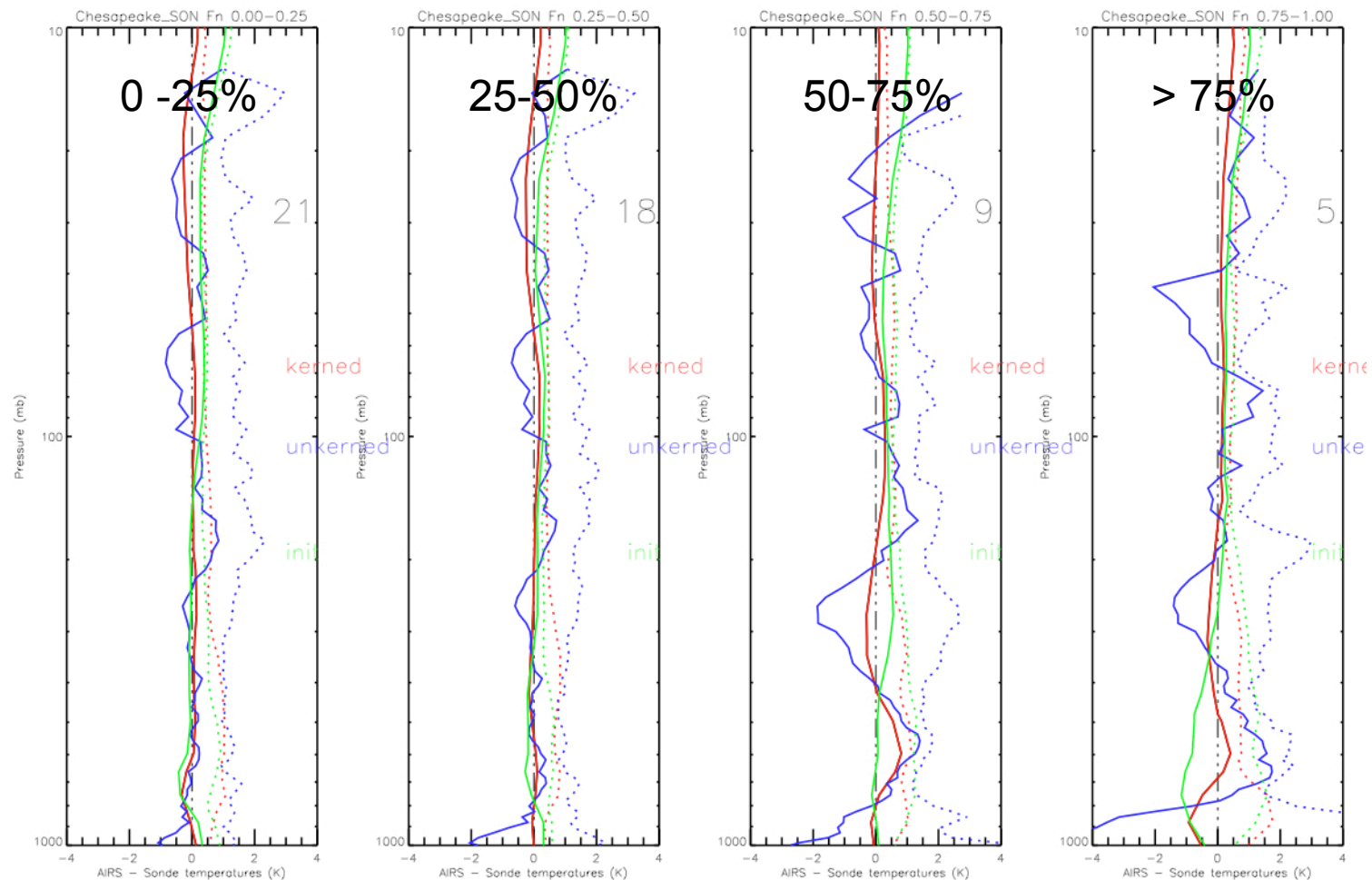
Further work

- Testing & debugging
- Quality control for sondes
  - E.g., handling data dropouts
- Water vapor (in progress), ozone
- Validation against different seasons, cloud conditions etc.
- Validation against different climate regimes
- Results to be used in V5 validation report

Preliminary Intercomparison of UT/LS Temperature Profiles between AIRS, GPS, and ECMWF (abridged)

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AIRS Science Team Meeting, Oct 2008, Greenbelt, MD

UT/LS

1. The upper troposphere and lower stratosphere (UT/LS) is the important layer responsible for the troposphere-stratosphere exchange.

2. Accurate knowledge of tropopause temperature, pressure and height is very important for detecting the global climate change.

Objective

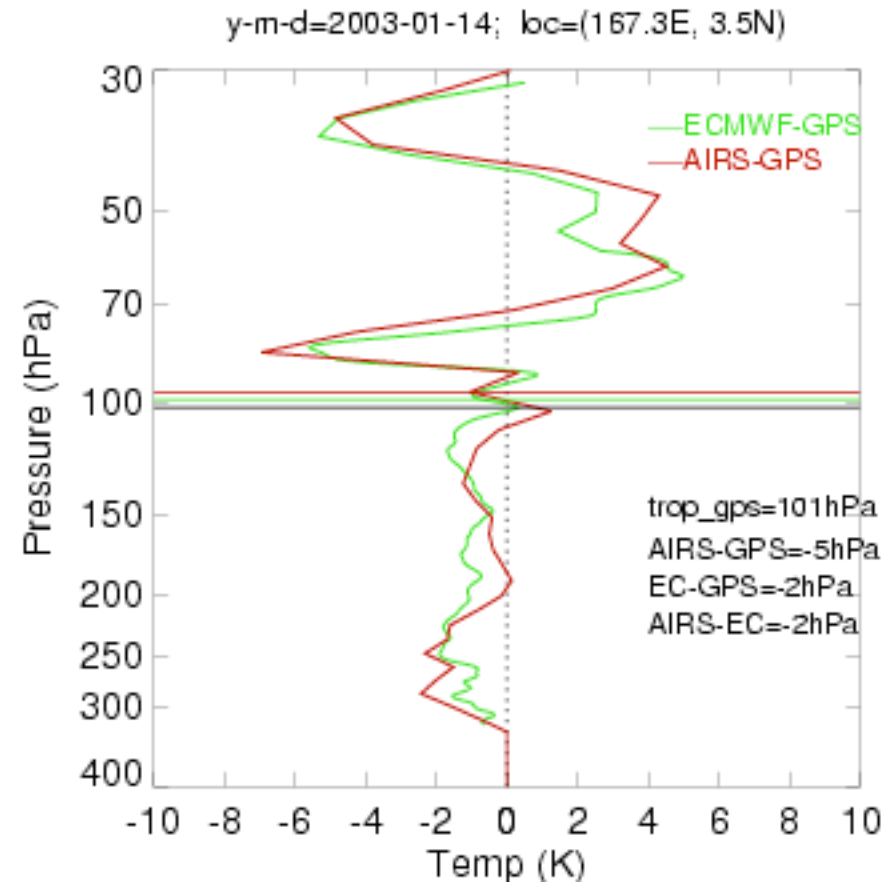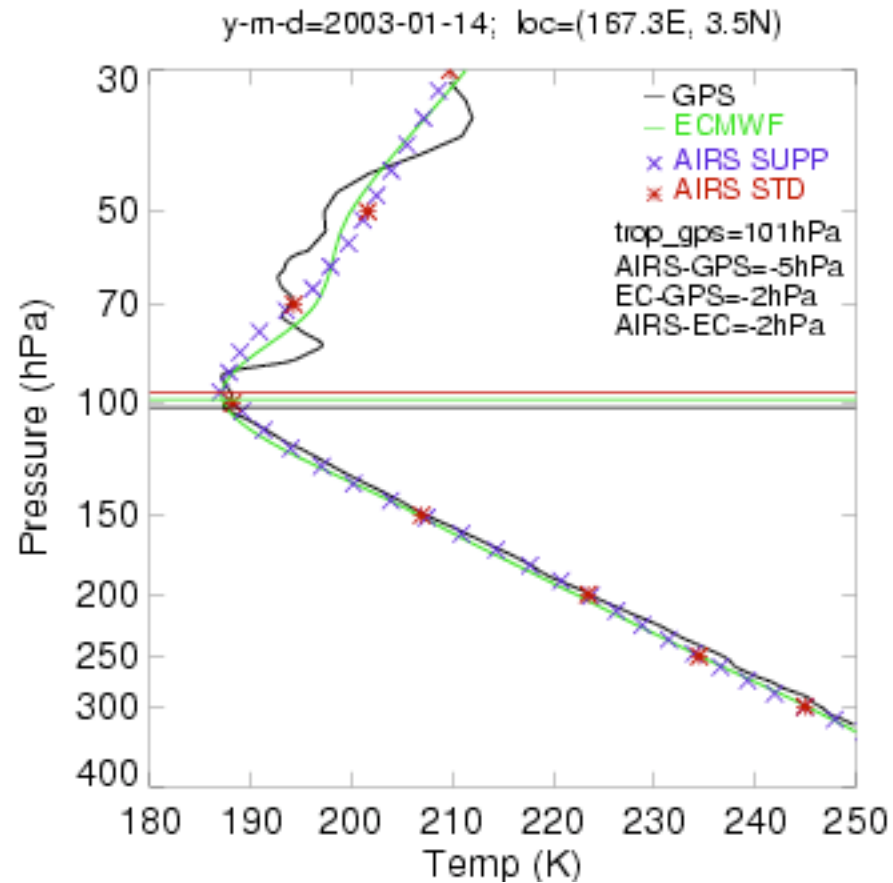To examine the ability of AIRS temperature retrieval to delineate the tropopause.

Matchup Locations for Jan 2003
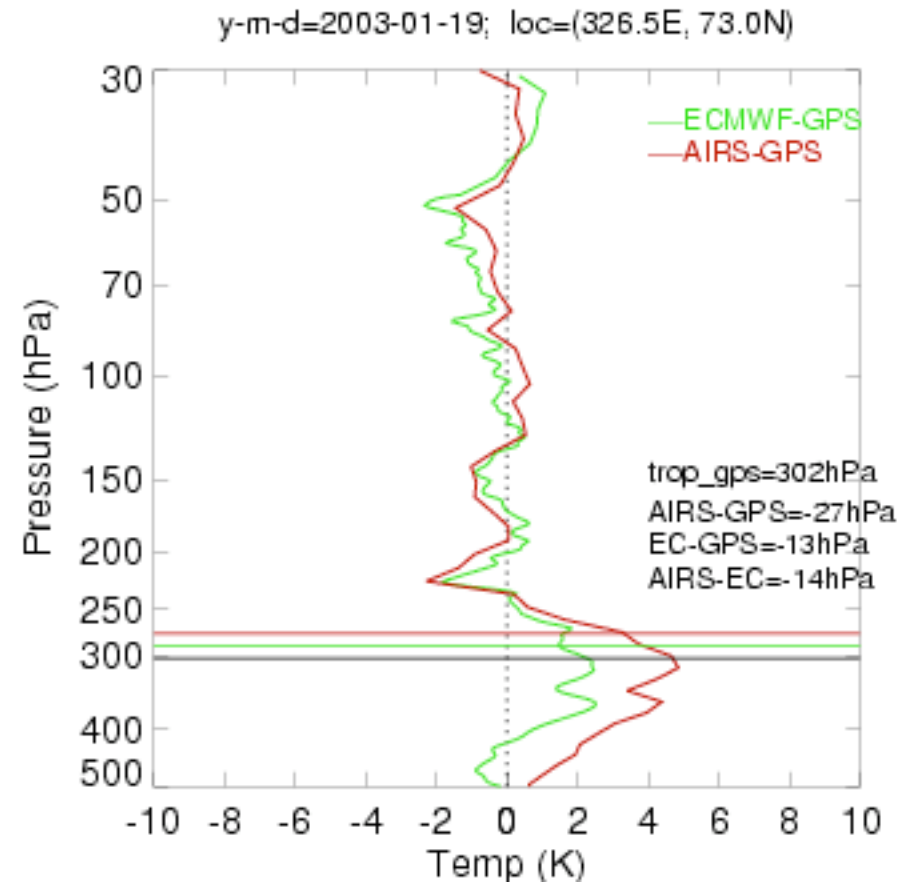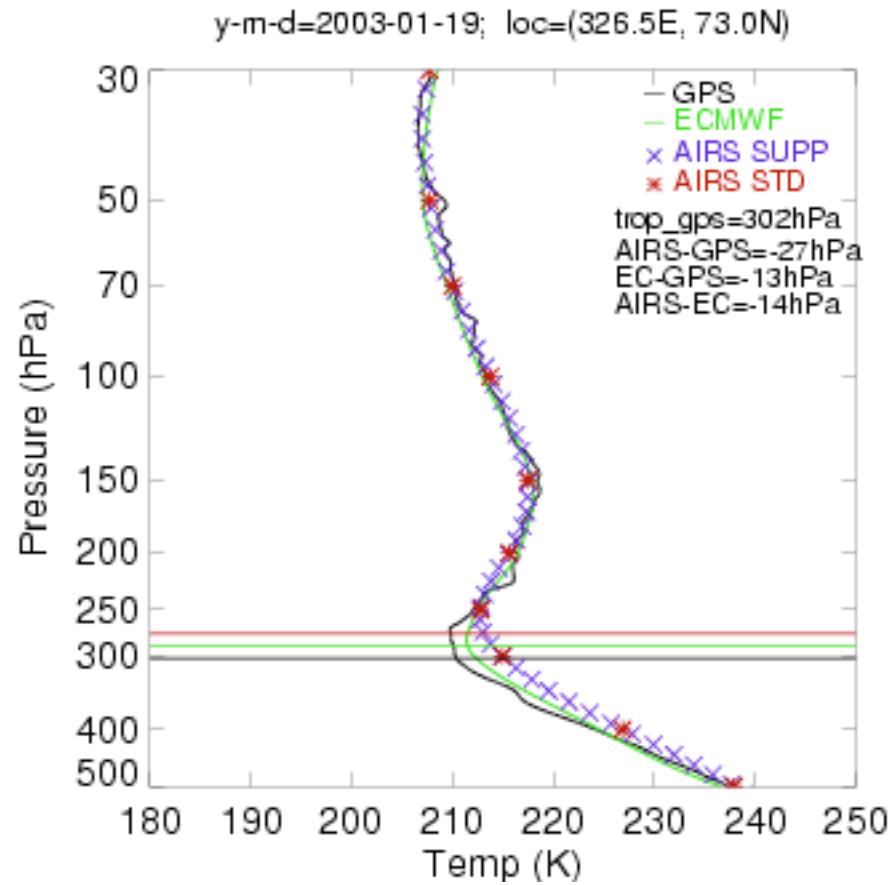## < 100 km, < 2 hr

GPS AIRS Matchup 2003-01 nocc=3409
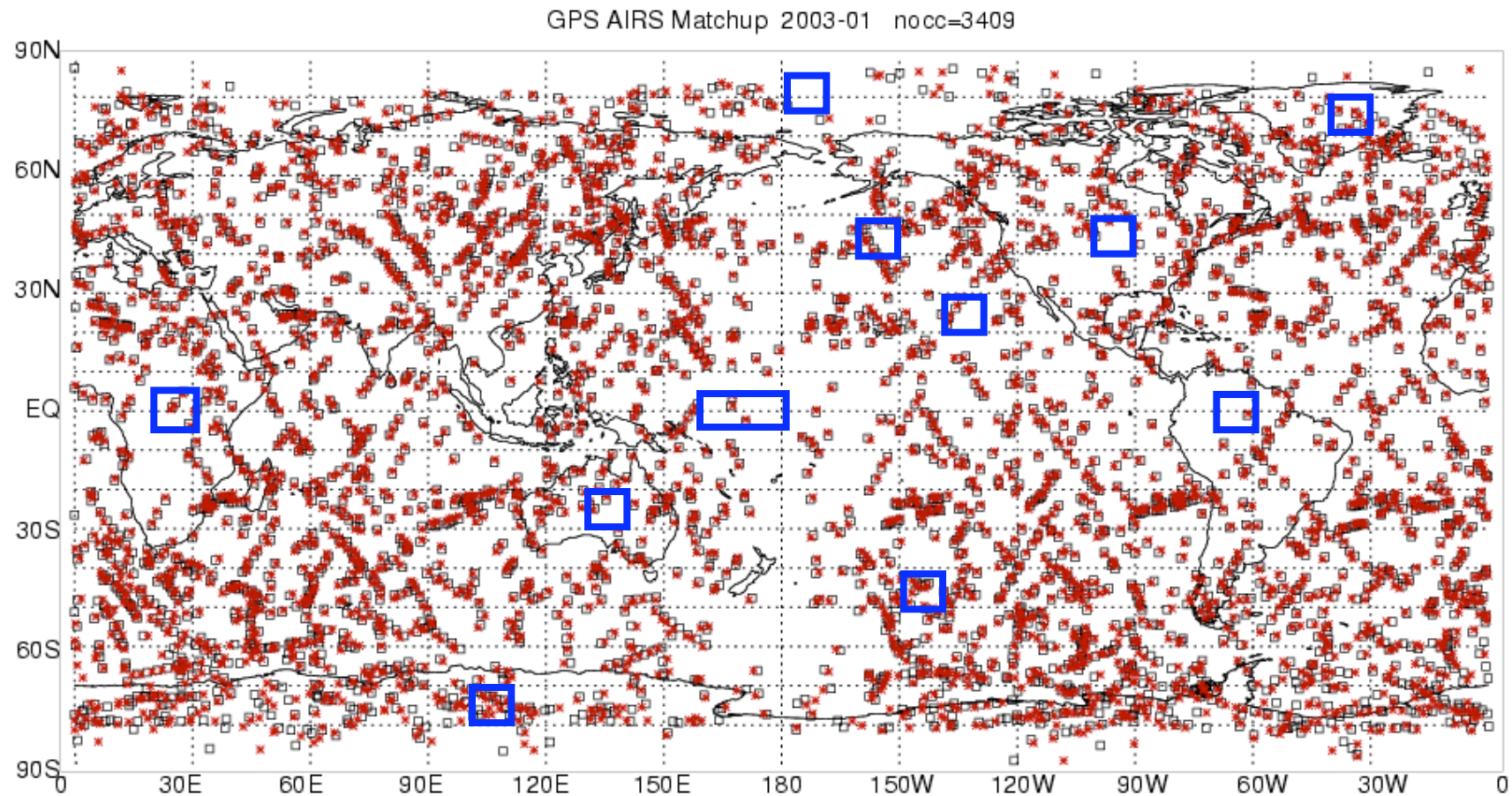
Black Squares - GPS; Red Asterisks - AIRS

Western Pacific

Iceland

Summary

1. AIRS can roughly capture the tropopause with an error of maybe 20hPa although detailed comparisons need to be done.

2. There are significant differences between AIRS and GPS temperature profiles (2-4K) especially near the tropopause.

3. There is a strong correlation between AIRS and ECMWF temperature profile errors relative to GPS.